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(54) **Web processing mechanism for forming packages**

(57) A form-fill-seal packaging arrangement comprises a carriage 18 having a processing mechanism 17 which draws web 9 from a roll 10 over a product-feeding means 15 to form a tube, and seals and cuts the tube during the downward stroke as the carriage 18 is oscillated about a horizontal pivot shaft. The roll 10, feed rollers 12, feeding means 15 and carriage 18 are all mounted on a single panel of the arrangement and a printing station may also be included.

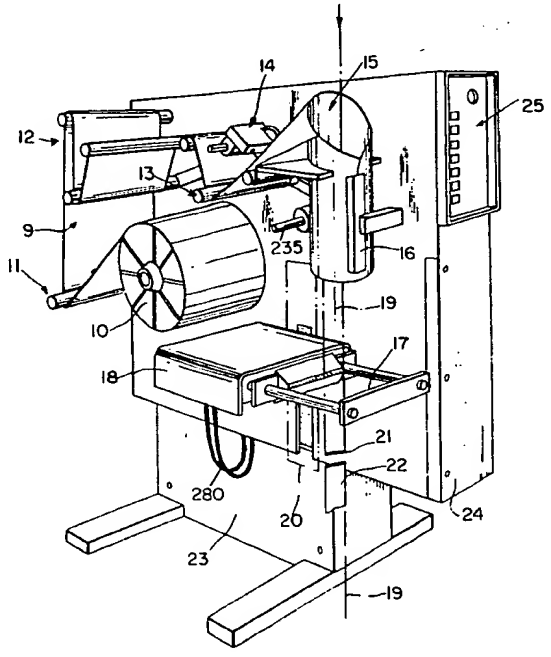


FIG. 1

GB 2 038 758 A

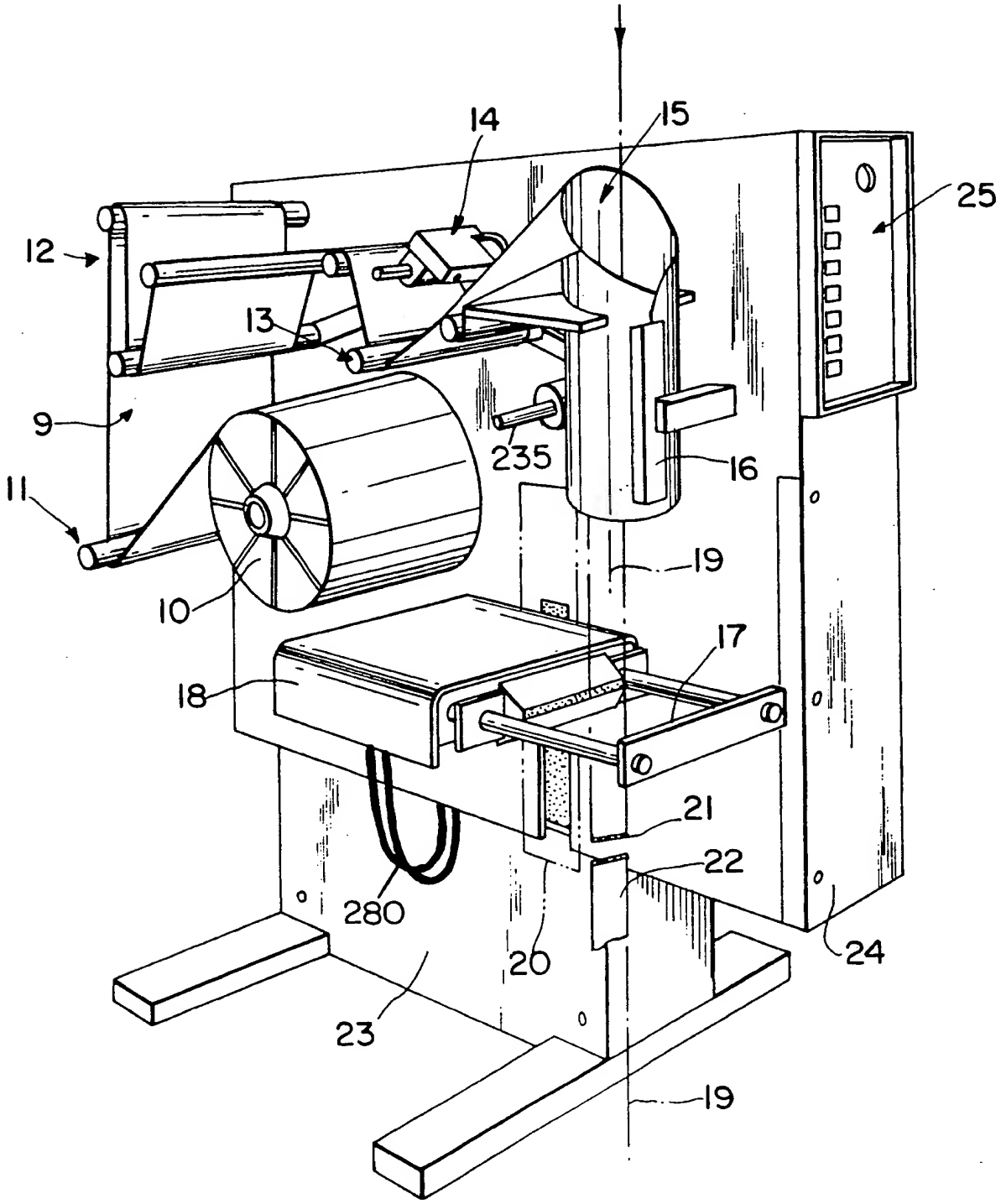


FIG. 1

FIG. 2

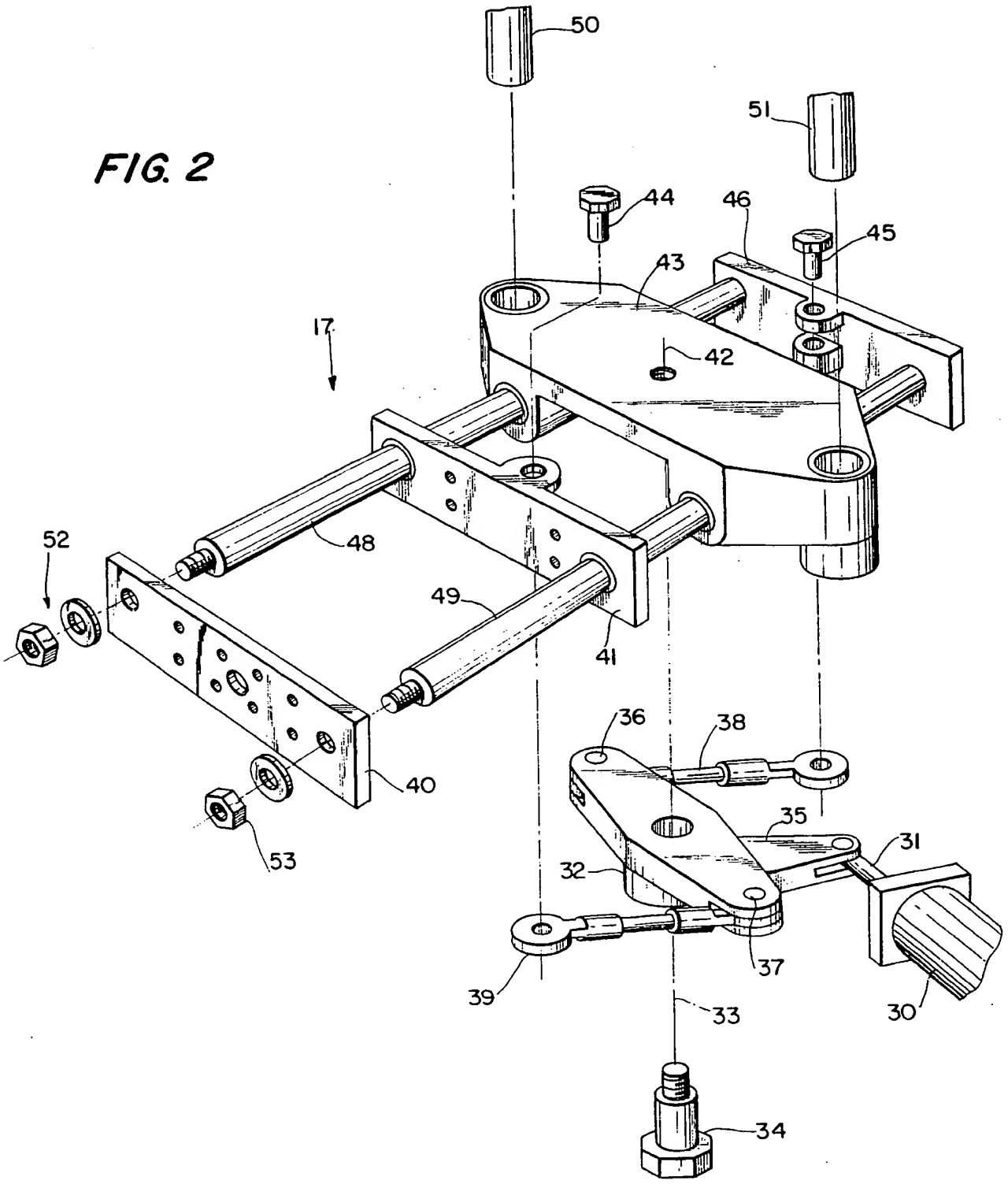


FIG. 3

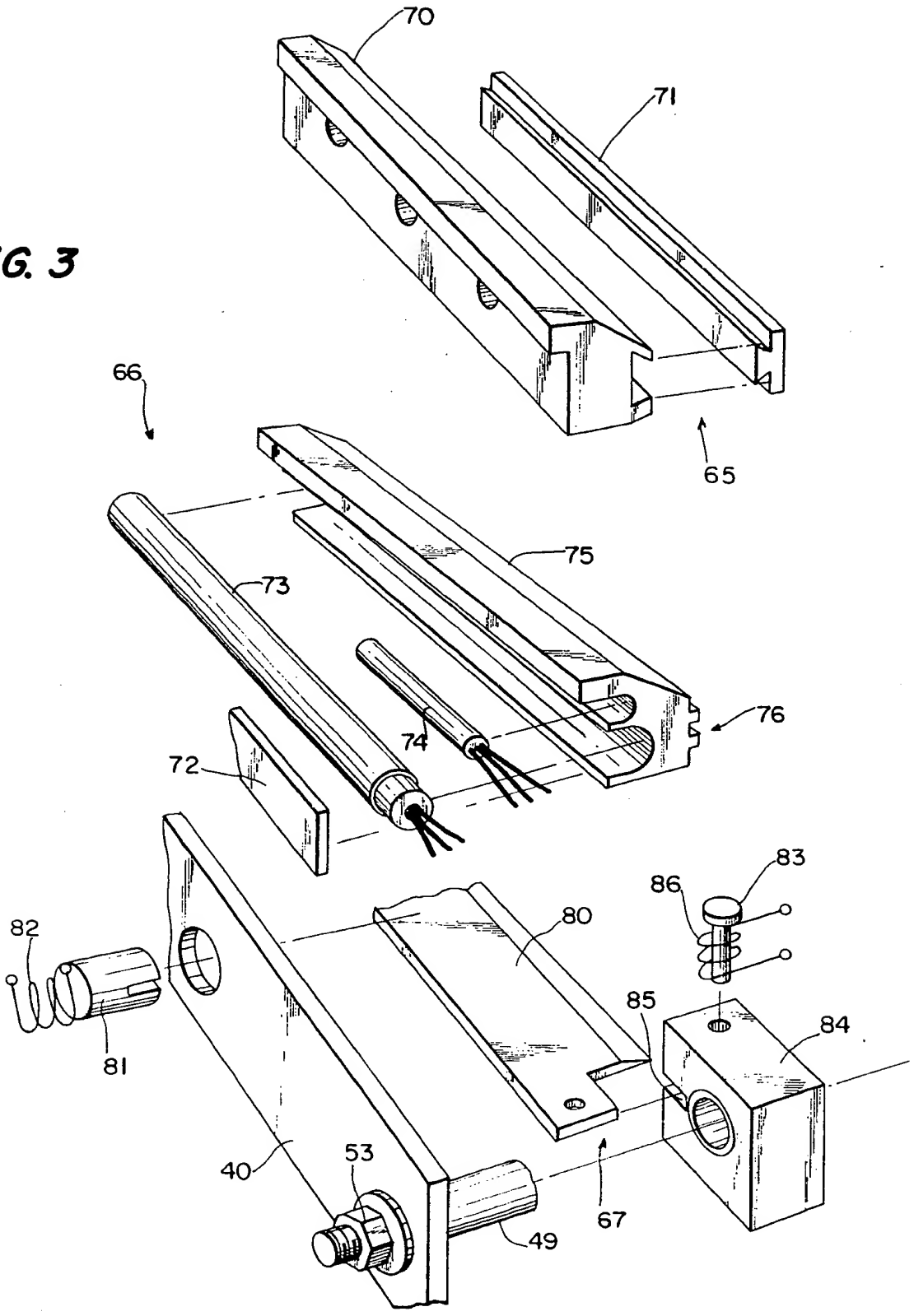


FIG. 4A

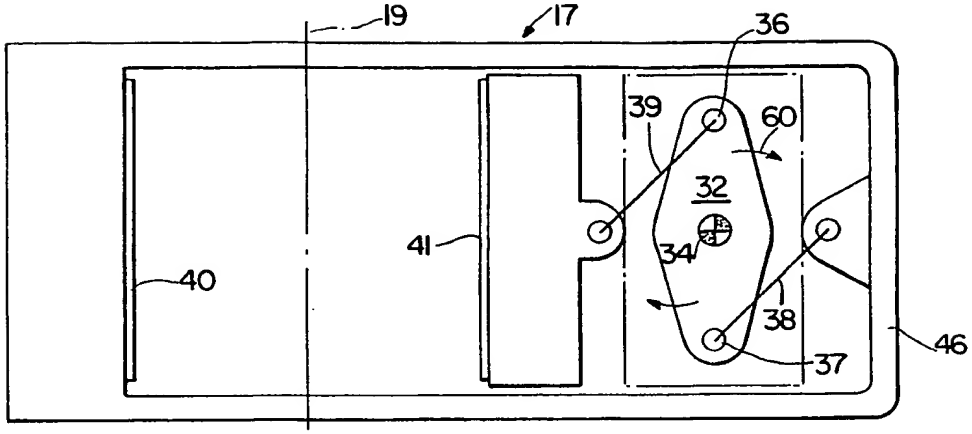
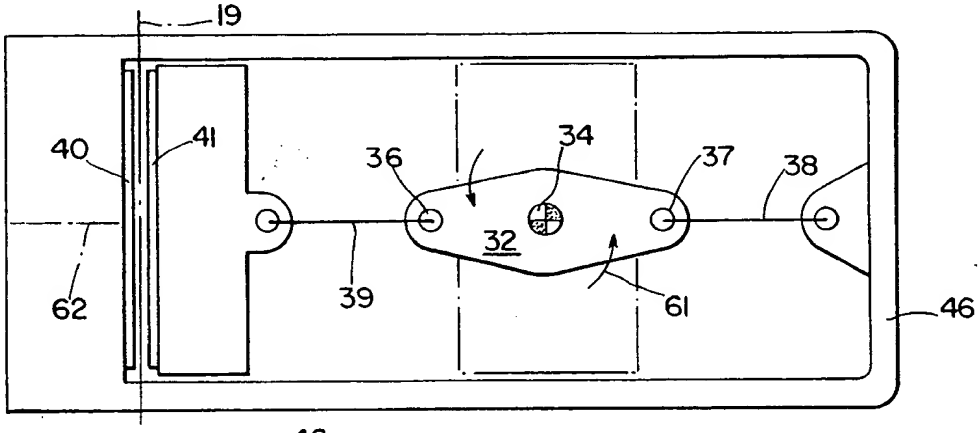


FIG. 4B



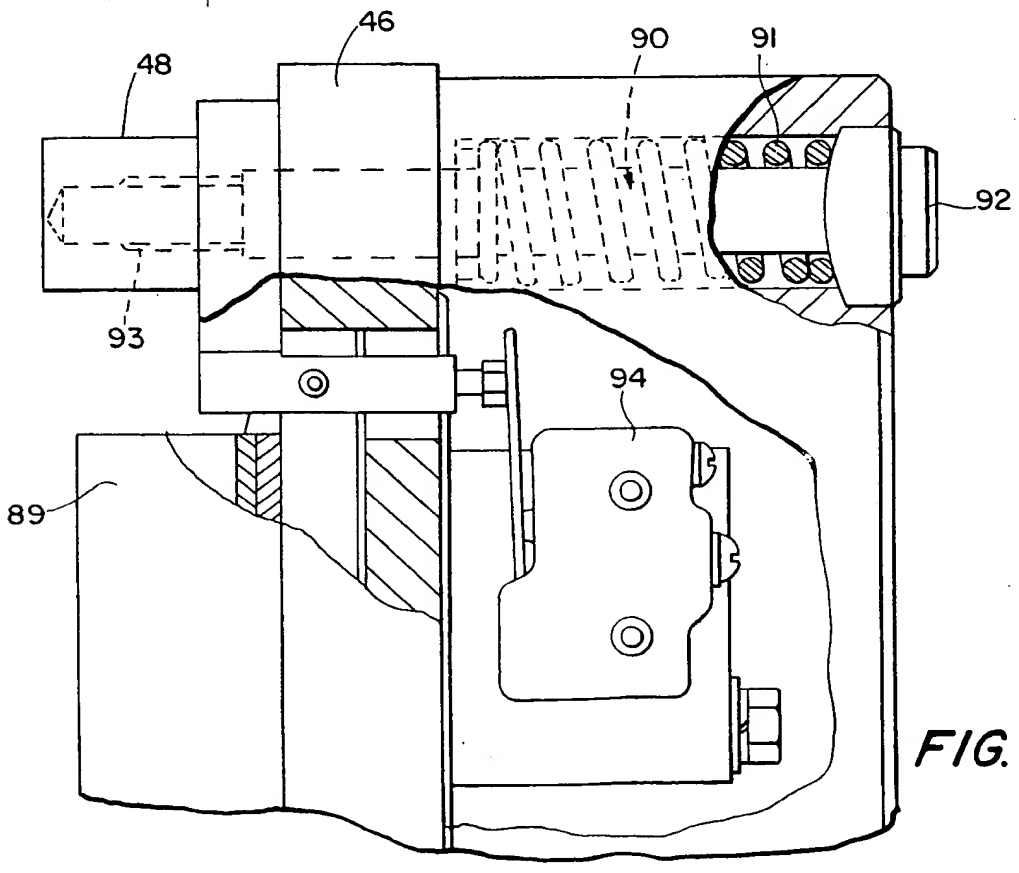


FIG. 5

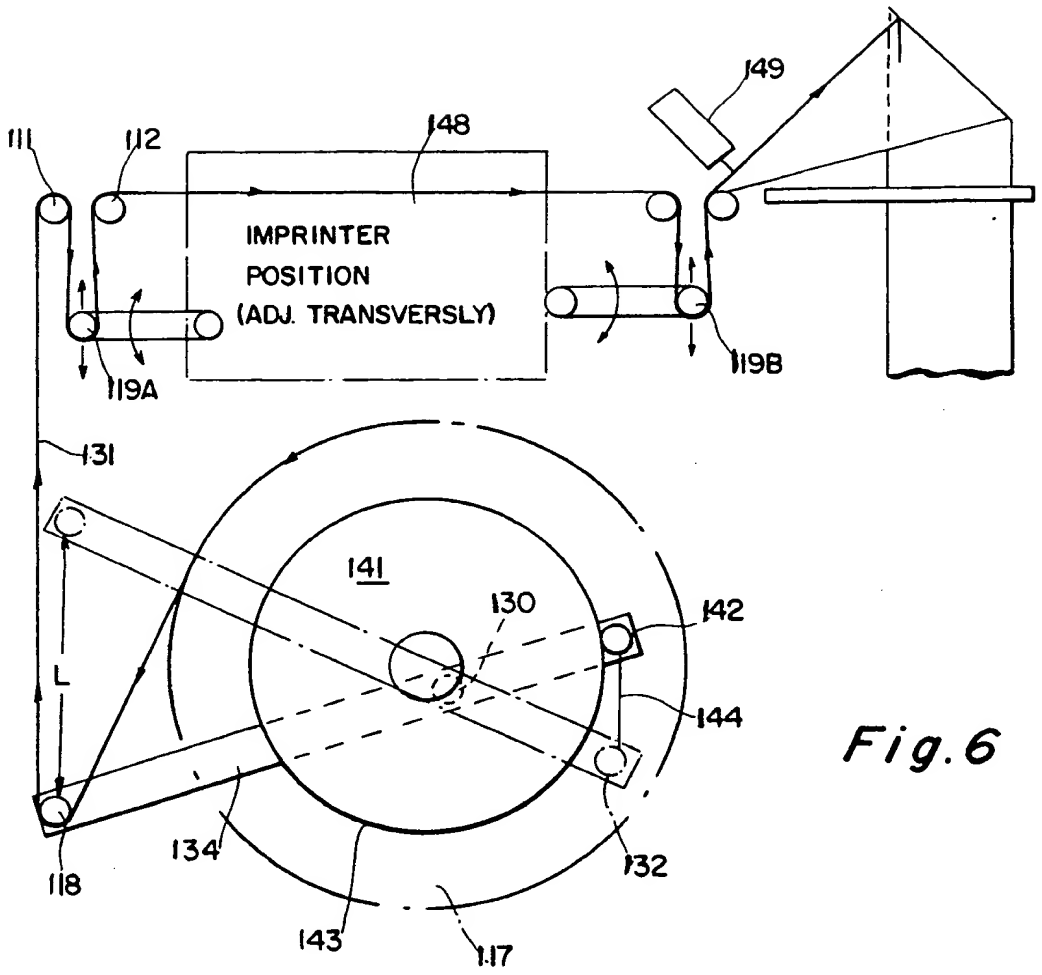

149
111
112
148
IMPRINTER
POSITION
(ADJ. TRANSVERSLY)
119A
119B
131
141
130
142
144
L
134
132
118
143
117

Fig. 6

Fig. 7

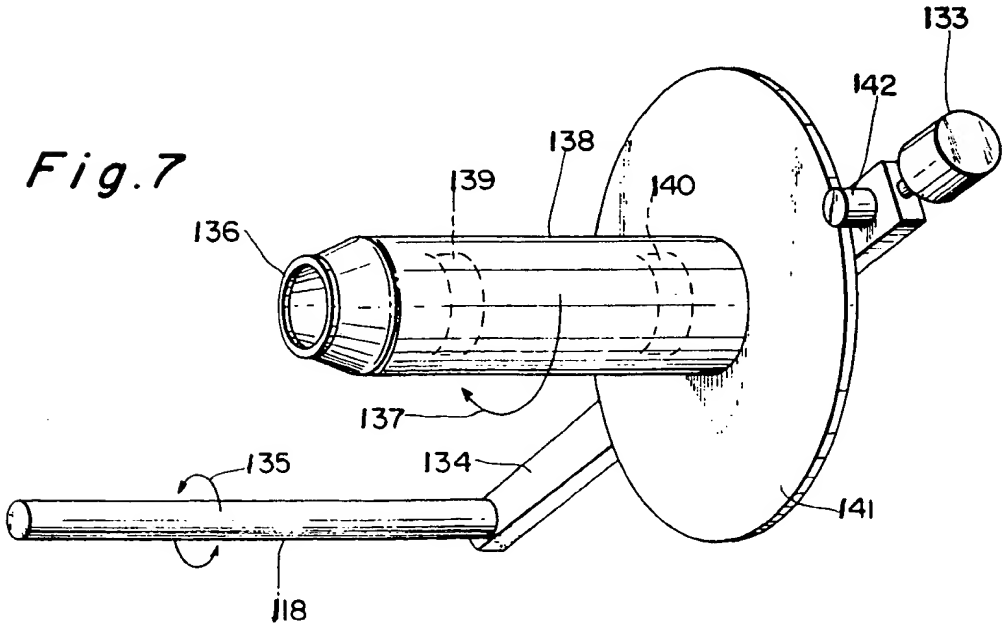
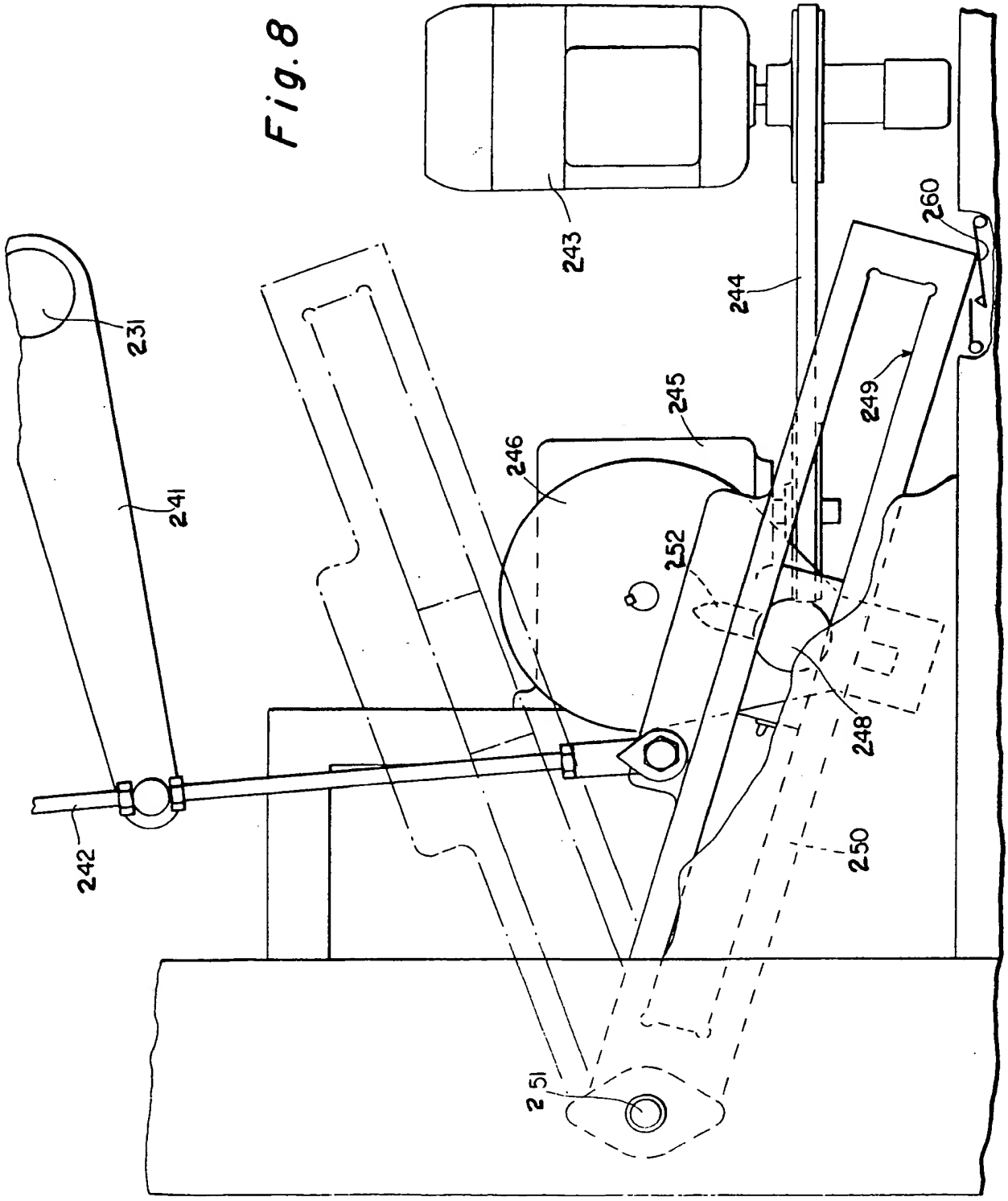

133
142
138
139
140
136
137
135
134
141
118

Fig.8



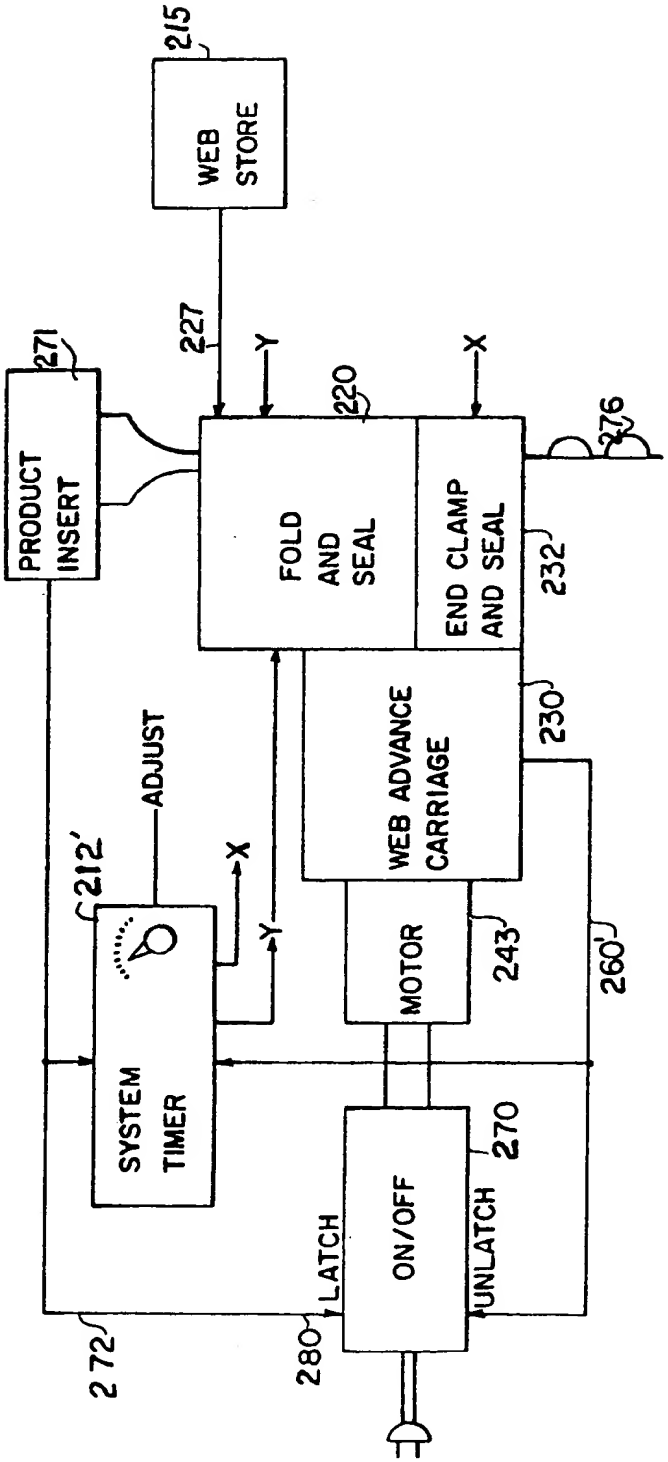
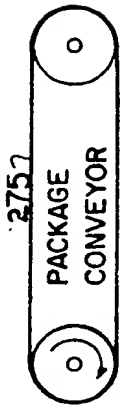

215
WEB STORE
227
Y
X
271
220
276
PRODUCT INSERT
FOLD AND SEAL
END CLAMP AND SEAL
232
230
WEB ADVANCE CARRIAGE
ADJUST
212'
X
Y
MOTOR
243
260'
SYSTEM TIMER
ON/OFF
270
LATCH
UNLATCH
272
280

Fig. 9


275
PACKAGE CONVEYOR

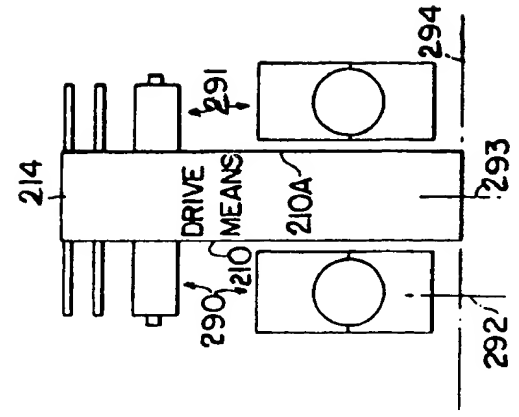

294
291
214
DRIVE MEANS
210A
293
290
210
292

Fig. 10

SPECIFICATION

Web processing mechanism for forming packages

This invention relates to machinery that forms packages from a web of thermoset material and more particularly it relates to packaging machinery having a web processing mechanism for grasping, sealing and cutting said web for forming packages of various characteristics about a product as the web is passed therethrough.

Representative background art relating to packaging machines forming packages from a web includes U.S. Patents 2,762,176 issued Sept. 11, 1956 to K.D. Knapp et al.; 3,544,340 issued Dec. 1, 1970 to R.E. Miller et al.; and 3,988,970 issued Nov. 2, 1976 to V. Hanson et al. Such machines also are commercially available as for example the form-fill-seal packaging systems manufactured by Sigma Systems, Inc., 231 Westhampton Place, Capitol Heights, Maryland 20027, which form from plastic web various packages for sealing in products such as hardware, candy, peanuts, etc., which may be counted out to assure each package has a known number of pieces.

At the heart of these machines is the mechanism for processing the packages by sealing the products in the packages during formation from the web and cutting the web to form individual or sets of packages. The operation and controls of such package forming and web processing mechanisms is critical to the automatic packaging machinery concept. Thus, the ideal mechanisms of this type need be foolproof, reliable over many cycles of operation, compatible in size and shape for mounting in a system, controllable to make packages of various size and characteristics, simple in construction, low in cost, and operable with little power. Also they should be adaptable for simplified controls in an automated system to vary package parameters.

Typical of web cutting machines are U.S. Patents RE 17079, issued Sept. 11, 1928 to J. Hahn; 1,667,184 issued April 24, 1928 to M.H. Ballard; and 4,054,075 issued Oct. 18, 1977 to J. Doorak. However, these and other prior art machines do not provide the reliability, speed, flexibility and comprehensiveness of operation in an automated packaging system that need be adaptable for various packaging conditions, nor are they simple and low in cost.

Further, such machines do not form a package in a continuous web and fill it with a product before cutting the package from the web. It does not therefore solve the problems presented by a complete automated product packaging machine that need fold and seal a web to form a package about a product with enough versatility to handle packages of various sizes with various kinds of products inserted therein.

Automatic multi-purpose packaging machines are generally known such as in U.S. Patent 3,054,246 issued Sept. 18, 1962 to J. H. Stroop.

The mechanisms involved tend to be complex and critical as to changes in package contents and size, such as Hopkins U.S. Patent 1,659,143 issued Feb. 14, 1928 and Stroop U.S. Patent 3,054,236 issued Sept. 18, 1962. Some have very complex web roller and feeding mechanisms as shown in Kato U.S. Patent 3,773,596 issued Nov. 20, 1973. Most drive systems depend upon pull roller drives, which causes complex web paths and make the changing of web rolls and the feeding of a new web end through the processing path difficult. Presently marketed packaging systems of the aforementioned types include form-fill-seal packaging systems manufactured and sold by Sigma Systems, Inc. in Capitol Heights, Maryland and by Package Machinery Company, East Longmeadow, Maine. All of these are packaged so that it is very complex to locate web paths and require when changing of web rolls the feeding of the web through complicated machinery paths inside cabinets and through power operated feed rollers that need be mechanised to feed the web thereby introducing danger of injury to an operator. Also control circuits, sequencing and timing operations require complex mechanisms and electric control devices.

Most systems require passing the web over a large number of rollers in a web feed system to equalize forces along the web while withstanding the longitudinal forces exerted along the web without excessive stretching or tearing, and to permit registration and alignment of the web throughout the system and particularly at work stations. Thus, web roll changover and threading through these complex systems is time consuming and tedious. The cabinet structure and location of the web path also in prior art machines interferes with web change although readily accessible and changeable web rolls are known in less complex systems such as in U.S. Patent 3,988,970 issued Nov. 2, 1976 to V. Hanson et al.

In some machines an intermittent asynchronous cycle is used. This puts great demands on web tension and webs frequently stretch or break when processing speeds are increased with highly accelerated starts or yanks on the web for pulling enough tape from a storage roll to form each package. Wherever reciprocating mechanisms are used to process these problems increase because of start up acceleration forces.

Another problem is that the web travel need be interrupted by a relatively long package seal time that is difficult to achieve consistently with high output capacity because it is necessary to keep the web stationary while sealing. This reduces output speed and requires complex web feeding systems to relieve strains and to produce timing of the required events in an automated system.

Timing and control systems are therefore very complex in fully automated packaging machines.

It is also a problem with complex prior art mechanisms and web feed paths to achieve high operational speeds since the necessary sub-operations are numerous and time consuming. This limits the speed of output production.

While some prior art systems such as Hanson et al., U.S. Patent 3,988,970 issued Nov. 2, 1976, have produced simple systems for making bags, with accessible cantilevered web rolls so that the web feed paths might be observed and changed more readily, no known complete packaging system for

packaging products with a continuous web has heretofore provided a structure with the versatility of efficient changover of web rolls, feeding of the web end and changeover of package and web size all simultaneously in a complete packaging system.

It is an object of the present invention to obviate or mitigate all or some of the aforesaid disadvantages.

Other features, advantages and objects of the invention will be set forth throughout the following specification, drawings and claims which include for example such features as doubling the package output speed without a corresponding increase of mechanisms or controls, producing very simple controls to thereby reduce the time and equipment required for completion of a packaged product, providing an entire packaging system with all web processing devices cantilevered on one side of a panel, and feeding the web out package by package, asynchronously if required, in response to a reciprocating web mechanism.

The present invention provides a simple inexpensive and adaptable automatic packaging system incorporating a simplified and efficient mechanism for processing a continuous web to form the packages, seal products thereinto, and to sever packages from the end of a continuous web from which they are formed.

Accordingly, a mechanism is afforded operable upon demand as programmed to automatic packaging system requirements, and providing significant operating force from a low power reciprocating member such as a hydraulic piston to open and close jaws in contact on opposite sides of a movable web. The mechanism incorporates a simple linkage coupled to a rocker member movable over an arc less than 360° to move jaw assemblies in opposite directions. This is accomplished by means of two links on opposite sides of the rocker member which move into substantially a straight line on opposite sides of the rocker member to reach an ultimate dead centre position for contact with the web at high force. This feature permits great closing power from a modest prime mover power and uses few parts taking up little space.

Coupled to the jaws are heat sealing members if thermoset plastics are being processed, and programmable knife cutting means for severing the web between packages either individually or in sets of two or more. Thus, the single simple jaw operating mechanism serves the multiple function of grasping and moving the web, sealing it into a package and cutting the package from the web as programmed in a single unit or in sets.

Additionally are provided features such as safety means for preventing damage to the machinery or a foreign object if it gets in the path of the jaws. Thus, upon intervention of an object between the jaws in the jaw closing cycle such as a hand the jaws are opened. The mechanism is well adapted for making different size packages and for filling efficiently with various products in a fast automated packaging system.

The system provides for asynchronous operation to form packages upon command at high repetitive speeds and includes such features as automated change of package length, simplified tensioning, processing, and feeding of the web compatible with accelerated start-up speed and high speed package formation. Preferably the web is of a thermoset plastic and can be processed to register pre-printed patterns for printing codes, pricing, etc. during processing.

The motive transit drive for the entire web path through the machine is a reciprocating web advance mechanism that transversely seals a folded over web to form package ends while pulling the designated length of web from a web roll through the web feed path.

Automatic braking and sealing cycles are simplified and reliable, but operate in a versatile control mode in full view for trouble shooting and start-up from new web rolls, with all mechanisms processing the web being exposed on a single side of a panel in cantilevered form.

The packaging system afforded by this invention achieves the foregoing objectives and advantages in improving the state of the art by means of a very simple set of cantilevered members mounted on one side of a single panel for processing web preferably thermoplastic from a roll to form it into a package about an inserted product that may be a known number of pieces of hardware, an apple, or like products. A reciprocating motor driven mechanism pivoting on an axis comprises one cantilevered member than processes the web and consists of the sole motivation means for advancing the web through the system a length at a time for each packaging cycle.

The web, which may be preprinted if desired, is folded over a tube and formed into a tube to receive a product thereinto and is sealed transversely on both sides of the product to complete a package. Thus, longitudinal and transverse sealing members respectively are located in the web path and are timed to operate respectively while the web is stationary and in motion by operation of the reciprocating mechanism which advances the web and retraces.

The invention will now be further described by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic view in perspective, of a package processing system afforded by this invention for processing a web to form and fill packages;

Figure 2 is a perspective exploded view of a package processing mechanism afforded by this invention to move a pair of jaws for engaging the web in the package forming process;

Figure 3 is a perspective exploded view of a typical assembly of web processing devices assembled on the movable jaws of the mechanism of Figure 2;

Figures 4A and *4B* are schematic representations of the jaw movement mechanism showing its operational mode respectively in positions with the jaws open and closed to grasp the web;

Figure 5 is a segmented view, partly in section, to show a safety feature attached to the movable jaw mechanism to prevent jaw closure in the presence of a foreign object in the travel path;

Figure 6 shows a schematic sketch of the web

travel path with associated web feeding, braking and processing equipment;

Figure 7 shows a perspective view of a web roll spool assembly and its cooperating tensioning feed-brake system;

Figure 8 is an elevation view of a packaging machine drive assembly as afforded by this invention;

Figure 9 is a block diagram control system diagram illustrating the timing and sequencing of operation steps in the packaging system of this invention; and

Figure 10 is a sketch of a twin web processing embodiment afforded by the invention having a common drive mechanism.

The packaging system as shown in Figure 1 has a web 9 fed from roll 10 around a dancing or metering roller 10 and a roller array 12 to proceed past a printing station (not shown) for imparting a print to the web at a position controlled by registration bar 13 and photocell 14. The printed web is then fed over web forming and product feeding tube 15 through the longitudinal sealer 16 which seals together the web edges to form a web tubing 15 from a counter-feeder device (not shown) which is synchronized for operation with the packaging cycle.

Before the products are fed into the web tubing, the web is closed transversely at the bottom to retain the products of operation of the package processing mechanism 17 contained in and operable with a web advancing carriage mechanism 18, which pivots one end portion up and down along the web feed axis 19 oriented downwardly from feeder tube 16. This web advancing carriage mechanism 18 is vertically adjustable in slot 20 for varying in one mode the package length between the feeding tube 15 and the transverse seal 21 shown at the lower extremity of the swing arc taken by the pivoted end seal carriage mechanism 18 along the web path 19.

By pivoting the package processing mechanism 17 by carriage 18 to move upwardly along the web axis 19, it closes its jaws to grasp the web and close the lower package end for retaining products inserted inside tube 15. The mechanism additionally seals at 21 and cuts the former package from the web in a position 22 so that the products need not fall far past the end of feeding tube 15 and where the severed package 22 has not far to travel to reach a bin or conveyor (not shown) positioned to travel along the panel 23 or under the console portion 24 for carrying finished packages away from the packaging machine in either of two normal axes.

A control panel 25 is afforded for providing manual selection of such internal system operating parameters as to control bag length, and the cutting operation to sever packages individually or in multiple package strips, etc. Consider for example metering out a weighed amount of coffee into each package where a series of packages is desired on a strip to feed an automatic coffee vending machine. Also sometimes it is desired to offer a "two for..." sale and thus a strip of two joined packages may be desirable, or perhaps for filling a carton it is desirable to have a dozen packages in a strip with partial perforations for readily severing individual packages.

Figures 2 to 4 are directed to the mechanism 17 for transversely processing the web after it is formed into a tubing at seal 16. A package is formed and preferably filled by grasping the web, closing the end to receive products, sealing the web together, and cutting the ends of the package from the web to form the individual packages or package strips. It is, of course, to be recognized that this invention provides a versatile packaging system which can be used in many modes without departing from the spirit or scope of the invention. For example, the packages can be formed in a strip as a series of separable bags without filling with a product, and the web can be formed of other materials than the preferred thermoset plastics by incorporating sealing means other than the heated seal member illustrated herein.

This web processing mechanism 17 is operated in proper synchronism with the automated packaging system by actuating a reciprocable hydraulic piston assembly 30, for example, for providing motive power thereto whenever a package is to be formed and severed from the end of the continuous web fed through the system.

The sequencing and timing of a web through the various operations is conventional and is done for example in the hereinbefore mentioned form-fill-seal packaging system line.

When the piston assembly 30 is actuated, rod 31 extends and retracts to pivot rocker member 32 about its axis 33 on the pivot pin 34 back and forth over an arc less than 360° by means of link 35. The rocker member 32 has two opposed arms 36, 37 extending on opposite sies of the pivot axis 33 for driving respectively two connector links 38, 39 to operate two jaws 40, 41 in a mode more clearly seen from the diagrammatic view of Figure 4.

Pivot pin 34 fits in aperture 42 in housing 43. The links 38 and 39 are connected by pins 44, 45 respective to jaw 41 and yoke member 46 which moves jaw 40 by its connection with the rods 48, 49 to thereby draw jaws 40, 41 together and apart as the piston rod 31 moves back and forth. Rods 48, 49 are journalled to pass through frame 43 and jaw 41, thereby permitting jaw 41 to slide on the rod through the journalled bearings. Frame 43 can be held in place on the frame of a packaging system to a member thereof by bolts 50, 51. Nuts 52, 53 hold jaw 40 removably in place on the rods 48, 49, and jaw 41 can also be removed from the rods.

With reference now to Figures 4A and 4B it is seen that the rocker member arms 36, 37 are pivoted in an arc about pivot pin 34 to assume a position at the two extremities of movement, depicted in Figure 4A and Figure 4B respectively, as the drive piston rod 31 and rocker member 32 reciprocates. The axis 19 of the web travel path is shown in position between the jaws 40, 41 with the jaws opened in the position of Figure 4A and closed to grasp the web in the position of Figure 4B. Thus, clockwise arrows 60 shown in Figure 4A indicate the rocker member 32 has been rotated clockwise to permit links 38, 39 to open the jaws 40, 41. Conversely in Figure 4B the counterclockwise arrows 61 indicate movement that closes

jaws 40, 41 on the web axis 19. In this preferred embodiment the arc of reciprocation approximates 90°. It is to be noted that this mechanism operable in this way uses a very low power hydraulic piston assembly 30 to exert high closing forces of the jaws 40, 41 to grasp, seal and cut the web as the occasion calls for during the programme of the automatic packaging system. This results from the manner in which the mechanism at closure of the jaws 40, 41 nearly lines the links 38, 39 in a straight line along linear axis 62 to provide near closing position a great leverage advantage, as operated in this mode with the mechanism pushing the respective jaw assemblies in opposite directions to close the jaws. This structure and mode of operation results in a very simple mechanism operable at low power over many cycles with high reliability and excellent grasping force on the web for closing, sealing, cutting or moving the web.

As may be seen from Figure 3, a series of devices may be attached to the jaws 40, 41 for engaging the web and processing it in the package forming and filling operation. Typically a cold grasping assembly 65, a heat sealing assembly 66, and a programmable knife cutting assembly 67 are spaced along the length of the web and transversely extend across the web width. Other devices such as a perforating cutter that forms a tear line between two packages without severing the strip can also be used, as desired.

In operation, the cold jaw inserts 70, 71 attachable to jaw 40 provide respectively a holder and a clamp with an elastic face that engages the opposite jaw assembly 41 to grasp the web. These parts interfit by the tongue and groove assembly shown so that a new rubber facing can be easily installed without disassembly. Thus, this cold clamp closes the web tubing at the bottom of a package to be formed so that it can be filled with products, while the devices 66 and 67 respectively seal and cut the web. Other combinations and devices could, of course, be used on the jaws.

The heated jaw element 66 stacks an insulator plate 72 and a heated metallic unit 75 into which is inserted in the receptacle grooves a heater element 73 controlled by a thermostat system operated by the heat detecting thermistor insert 74 located inside the receptacle jaw facing unit 75. Thus, the unit 75 is heated to the proper temperature to press bead (or beads) 76 against the tubular web and seal the two layers together transversely at a location between successive packages.

The cutter assembly 67 has the knife blade 80 movable selectively into cutting position against an anvil (not shown) on the opposite jaw 41 by means of movable drive pin 81 which as programmed by the automated system moves longitudinally to engage knife 80 and push it forward to cut the web at a position located between two adjacent packages. If controlled by a solenoid or hydraulic cylinder the drive pin can be intermittently controlled at the times desired. However, if cyclically driven during each package forming cycle by a cam or the like, it is provided with an intermediate compressible spring assembly 82 so that it can proceed over the cycle even if the knife blade is stopped short of the cutting position by inserting pin 83 in the block 84. The blade 80 is stopped short of the cutting anvil because pin 86 hits the blade on entry to slot 85 and thus holds it away from cutting position to skip a cutting cycle whenever programmed by the accompanying system to operate solenoid coil 86 or some equivalent mechanism as a cam operated interposer. The solenoid coil 86 thus is used to selectively control the cutting cycle in the process of providing strips of two or more adjacent packages.

If Figure 1 is viewed, it is seen then that the jaw assembly mechanism 17 is pivoted upwardly where the jaws can be closed to grip the web by means of cold jaws 65 thereby closing the web tubing and permitting entry of a product in tube 15 for forming a package around the product. As the jaws pivot downwardly by operation of the mechanism 18, and pull a corresponding length of web from the roll 10, there is time to heat seal at 21 and cut the web to form separate package unit 22 by cutting at the top of the preceding bag. A similar heat seal unit to 76 may be located on the jaw 40 beneath the knife 80 if desired to seal the top of the preceding bag, which is released when the jaws open to drop vertically into a bin or on a conveyor belt.

As may be seen from Figure 5, the yoke member 46 at the link end of rod 48 (Figure 2) may be fitted with a stripper spring assembly 90 which arranges spring 91 about the bolt 92 connected to threads 93 in rod 48, so that it compresses whenever member 89 hits an obstacle such as at the end of the jaw closing cycle. Thus, at the end of the jaw closing cycle when the link driving reciprocating member 32 is reversed, the spring 91 serves to provide a spring biased stripping action at the start of the reverse reciprocation to help the jaws open.

The microswitch assembly 94 is actuated whenever the spring 91 is compressed before the end of the jaw closing cycle and serves through appropriate control circuits to reverse the jaw control cylinder 30 and open the jaws. Thus, the spring 91 is designed to yield and operate switch 94, for example, if a person got his hand in between the jaws during a closing cycle as soon as member 89 is encountered to compress spring 91 and thus actuate switch 93. The switch also operates if undue friction is encountered or other objects impede the closing of the jaws and thus serves as a safety feature, and can be locked out when the jaws are nearly closed if the cylinder is reversed by other control means during the automatic cycle.

A brake operable on the web roll to prevent backlash is depicted in Figures 6 and 7 as operable by the dancing roller assembly 118, similar in general operation to that in the foregoing Knapp patent. Thus the roller 118 used the force of gravity by the pivot arm about axis 130 to engage the web 131 and rotate web roll 117 counterclockwise to meter out an appropriate length of web L to form a package as the dancing roller 118 pivots downwardly from the upward limit at phantom position 132. A counterbalance 133 can be adjusted for proper web tension, and also the length of the pivoted dancing roller arm and weight of the roller 118 which is

fastened to pivot arm 134 for rotation as arrows 135 indicate can be varied to fit different web conditions.

This mechanism has novel features including the following: A web roll of any desirable width is inserted over tapered end 136 of the rotatable (137) web roll spool assembly 138 and held in place by end mounts 139 and 140, with disk 141 spaced from the web roll end to avoid interference. The circumferential edge 143 of the disk 141 serves as a braking surface encountering brake block 142 carried by pivot arm 134 in encountering the disk edge on a tangential path 144. Thus a very simple structure serves to prevent tearing of the web as it is yanked through the system by releasing the length needed by lifting pivot arm 134 during the feed acceleration period and then as the web is stopped by producing a gentle unrolling of web from spool 117 by gravity action on roller 118. This operates well from full to empty web rolls and is not critical for webs having different widths, weights, strengths and elasticity.

The remainder of the web travel/path operating in conjunction therewith is simple for threading over rollers 111, 119A, 112, etc. Adjustable roller 119A can permit registration of preprinted patterns on web 131 with an imprinter 148 for coding, pricing or addressing a package. Similarly registration roller 119B can adjust the registration of a pattern with the longitudinal sealer mechanism 18 (Figure 1). Both registration rollers can be served for automatic alignment in response to photo detectors 149 or the like.

In operation the web is simply hand threaded without necessitating any power cycle or operation through a machine cycle to pull the web into place. Thus, the web is passed over tube former 15 and vertically dropped into jaw assembly 17 where it is thereafter grasped for a machine operation.

Forward movement of the web is controlled solely by the pivoted carriage assembly 18, which pivots about a pivot axis in the manner described in connection with Figure 8.

In general operation the carriage 18 pivots to move the grasper jaw 17 upwardly along the vertical axis path of the package tubing 19 thereby to close and transversely seal the tube on both sides of the product in sequential operations for example to form the package. After the jaw 17 is closed to grasp the web, then the carriage 18 is pivoted to move jaw 17 downwardly before releasing the web for another bite in reciprocating action. This advances the web package by package in a cyclic manner that can be programmed asynchronously as later described.

As also seen in Figure 1, the forming and filling tube assembly 15 can be simply replaced for different web widths and thus different package sizes by slipping on and off a quick change cantilevered pin 235 registering in the tube assembly 15 for receiving a retainer ring and cutter key.

Also it may be seen in Figure 9, for example, that a package conveyor may be located under the slicer jaw 232 to receive packages severed from the web and transport them in either of two directions, namely parallel to the panel 23 or normal thereto. Because of the action of pivot carriage 18 at the limit of the upward movement the web tubing is transversely closed so that products need not fall far through entry tube 15. Also the transverse sealing takes place as the web moves downwardly to the bottom limit of movement, where a package 22 can be severed from the web so that it has little distance to drop into the conveyor.

The control mode of this system is most simple as seen in Figure 9, primarily because of the simple pivot carriage assembly for advancing the web as hereinbefore described, and the fact that the motor drive therefor can be easily controlled by simple control circuitry. It is clear that the movable mechanical parts are minimized and those present are simple comprising for example the web rollers which have cylindrical shells journalled on cantilevered bearing pins attached to panel (Figure 1).

The on-off motor controls 270 may comprise a simple latching relay for example that is controlled from either the switch 260 feedback path 260', the presence of a product ready to be packed at product insert means 271 by way of lead 272 or by control circuitry operable from the console panel 251 (Figure 1) for establishing various time sequences to cover different packaging requirements, such as auxiliary printing and to time the various simple functions of the hereinbefore described system of Figure 1.

The package conveyor 275 is shown for receiving packages 276 formed from the web as they are sliced off the web by the end seal mechanism 232 and released at the bottom of the carriage 18 pivot stroke by opening the clamping jaws.

In a typical asynchronous operation sequence, a product arrives at product insert station 271 or is counted out as a specified number of bolts, and thus triggers a latch pulse at 280 turning on motor 243 for an operation cycle unlatched by the end of cycle switch at line 260'.

The carriage 18 pivot axis 231 is referenced in Figure 8 to show the means inside cabinet panel 23 for moving the web. Thus pivot arm 241 is moved back and forth by threaded connecting link 242 after adjustment by locking nuts 243 for the appropriate position of carriage 18 at the uppermost end of the reciprocation.

Link 242 is reciprocated by motor drive means 243 through belt 244 and gear box 245 to operate at proper hightest package cycle speed in the order to 60 packages per minute. Thus, the flywheel 246 will rotate in one second to produce one complete reciprocation of link 242 and therefore carriage 18, by means of cam pin 248 riding in slot 249 to pivot arm 250 about pivot point 251.

The stroke length, identified by the showing of pivot arm 250 in phantom at the top of the stroke and in full lines at the bottom, may be changed by locking the cam pin 248 at different positions in the slot 252 in flywheel 246. This can be used for example to change package length. For a long package therefore the carriage 18 will pull a longer length of web from roll 10 than for a shorter package with a shorter reciprocation stroke. Switch 260 may be used for control purposes to denote end of cycle or to put the operation into a cyclic mode by programming the next cycle as soon as a prior one is completed.

Other timing synchronising signals are derived from the timer 212' which processes both the product ready and the cycle completion input pulses for deriving other timed sync signals such as X for the transverse (abscissan) sealing, grasping and cutting operation of end clamp X and Y for the longitudinal (ordinate) sealing operation of sealing device 220. Thus, in the cabinet (Figure 1) a solenoid or air cylinder in pivoted carriage 18 will operate jaw 17 in response to the X sync signal, and for this purpose (Figure 1) air tubes 280 are shown.

In general seal 16 is closed as the carriage 18 pivots upwardly and whenever awaiting a product signal, and is opened to permit web movement on the downward stroke of carriage 18.

The clamping jaw 17 is closed just before the downward stroke, and released before the upward stroke. If desired a timer in the control system can change the package length between reasonable limits by using a range from only part of the entire downward stroke to pull the web through the system for forming a further package assembly. Also by proper controls cutting of packages from the continuous web can be limited to produce a sequence of two or more joined packages, and possibly two side by side packages can be formed or two serial packages in one stroke without departing from the concepts of this invention.

Because of the simple mechanisms and controls and the timing of the sealing, high speed operation is possible in the order of 60 strokes per minute. As shown in Figure 10, the mechanism layout also is very advantageous for operating at 120 package strokes per minute with the same drive mechanism, by mounting the cantilevered web processing assemblies 290, 291 on opposite panel sides 210 and 210A of the cabinet assembly 214. Two different products may thus be packaged simultaneously for conveying out in separate conveyors on axes 292, 293 or mixed for a single conveyor on axis 294.

A very simple packaging machine and mechanism is afforded that can therefore work at high speed producing in the order of 60 to 120 packages a minute from a web of thermoplastic material that is folded over and sealed around a product such as peanuts or bolts. Easy web roll changover features are provided together with simplified changeover for different package widths and lengths. The system can be asynchronously operated on command for a packaging cycle when a product is ready for packaging as for example when a counter puts a dozen bolts in a batch and delivers the batch for packaging.

The mechanism is preferably used with thermoset plastic web materials to heat seal the web in formation of both longitudinal and transverse seals to form packages into which products such as peanuts or hardware are inserted and sealed.

The particular mechanisms afforded are simple, safe, sanitary, reliable, inexpensive and adaptable to various packaging conditions for food and other product lines and is adaptable for use with product batch counters to control the exact number of items packaged.

The web feed system of this invention is particularly adopted to an intermittently and asynchronously operated packaging system that products one package array at a time on the end of a continuous web stored on a roll by advancing from time to time a predetermined length of web from a storage roll as necessary to form a new package array. The winding and reeling system provides for simple web replacement, simple reeling equipment handling, imprinting of local indicia such as pricing or coding in registration on the web with pre-printed cyclic patterns on the web, and is particularly adopted for automatic changes of package size and web length processed for different package arrays.

CLAIMS

1. A packaging system for making packages about a product from a continuous web feeding thereinto having a panel, a set of rollers cantilevered to one side of said panel holding and feeding the web, and means for advancing the web through the machine consisting of a pivoted carriage extending from a pivot member on said one said of the panel to reciprocate over a pivot stroke and including web clamping means operable during a predetermined stroke length to grasp and advance the web.

2. The system defined in claim 1 including a drive motor coupled to pivot said carriage by a reciprocating mechanism.

3. The system defined in claim 2 including means adjusting the length of said reciprocation thereby to adjust the length of web advanced for establishing a package length.

4. The system defined in claim 1 wherein a web folding, sealing and product inserting tube is positioned on the panel with said cantilevered rollers for processing the web to form a tubing for receiving a product thereinside.

5. A packaging system as defined in claim 1 including a plurality of rollers conveying said web from said source of web supply to said package forming mechanism, a single panel frame member, and cantilever means mounting said rollers by only one end to said panel whereby the web path is accessible without demounting any frame members.

6. The packaging system of claim 5 wherein the package forming machinery extends from the panel on the same side as said rollers and comprises both means sealing said web to form a package and conveying means to receive packages formed from the web and transporting them away from the system.

7. A packaging system as defined in claim 6, wherein a common mechanism is contained in a central compartment operating two duplicate systems as defined in claim 1 located on opposite sides of the compartment.

8. A packaging system as defined in claim 1 having a feed system for advancing a web asynchronously from a rotatable web roll in separated incremental periods by release of corresponding incremental lengths and forming therewith a package, and braking means for controlling rotation of the web roll and feed of the web through the feed system to occur only during the incremental period during which the web is advanced by said advancing

means.

9. A packaging system as defined in claim 8, wherein the braking means comprises two members located respectively to brake web travel at positions along the web travel path located near the web roll and near the advancing means, and control mechanisms operating both said brakes during the periods that the web is not being pulled through the feed system.

10. A packaging system as defined in claim 8, having a work station positioned adjacent the web travel path in said feed system with a characteristic that requires precise registration with predetermined increments of the web length, and an adjustable roller in the web path that establishes a variable path length of the web through the feed system for registering the web at said work station for processing different increments of web length.

11. A packaging system as defined in claim 8, processing a pre-printed web roll having a repetitive pattern along the length of the web, a pattern detection device positioned to detect the web pattern, and means responsive to the detection of the pattern by said device conditioning said reciprocating member for pulling a length of said web from said feed system with said pattern along said predetermined length.

12. A system as defined in claim 8, including means automatically adjusting the web feed system for changes in package length programmed by movement of said reciprocating member to pull different lengths of web from said roll.

13. A system as defined in claim 1, wherein the web feed path has a series of rollers all cantilevered and all other web processing devices located on one side of a mounting panel for access in replacing the web and threading it through the system.

14. A packaging system as defined in claim 1, with programme means for making adjacent packages of different lengths from a continuous web fed through a web feed path from a web roll, including means initiating upon a common signal the release of the web asynchronously for each package unit formed from said web, intermittently actuatable web advancing means responsive to said command signal for pulling a programmed variable length of web from said roll constituting the sole motive transit means for passing the web through said path, means establishing programmes for pulling at least two different web lengths on command, means selecting said programmes in a succession in response to successive said command signals thereby withdrawing sequentially from said roll two different lengths for forming therewith corresponding packages of different lengths, web processing means passing the web from the roll to the web advancing means, and means braking both the web roll and the passage of the web through said path when said web advancing means is not pulling tape through said web feed path.

15. A packaging system as defined in claim 1, feeding a continuous web through a tubular forming member folding over and sealing the web edges longitudinally, and thereafter transversely processing and sealing the web to form a sequence of packages by a processor mechanism transversely engaging the web as the web is fed past the forming member in tubular form, having,

a pair of movable jaws for gripping said longitudinally sealed web, motive means relatively moving sai jaws into and out of engagement with said web on opposite sides thereof comprising a reciprocable member providing motive power for moving said jaws in and out of said engagement,

a pivot axis,

A rocker member with opposed arms extending from said pivot axis and pivotable about said axis connected for rotation through a reciprocating cycle arc of less than 360° by said reciprocable member, and a link connecting either rocker arm respectively to one of said jaws for moving them simultaneously toward and away from engagement with the web in response to reciprocation of said reciprocable member.

16. The system as defined in claim 15 wherein the linkage lengths and jaw movement are related so that the rocker arm extends the links to a position substantially along a straight line as the jaws engage said web, thereby to provide substantially infinite pressure on the jaws with relatively small power produced by said motive means.

17. The system as defined in claim 15 including means advancing the web a predetermined length and control means coupled to operate said reciprocal member for grasping said web once during each web advance.

18. The system as defined in claim 15 wherein the web is of a thermoset characteristic including a heated member engaging the web as the jaws move into engagement thereby to form a transverse seal between two web layers.

19. The system defined in claim 15 wherein the jaws have mounted therein three members longitudinally spaced along the web travel path comprising a heated sealing member, a knife and a cold web gripping member.

20. The system as defined in claim 15 wherein a knife is mounted on said jaws to cut the web as the jaws move into engagement.

21. The system defined in claim 15 including means mounted in the jaws to seal the web together transversely as the jaws close wherein the knife is held for movement with said jaw only when engagement by a selectively operable knife engagement member, and means operating said engagement member cyclically in response to longitudinal movement of said web thereby to permit at least two sequential packages to be sealed by the sealing means in adjacent positions along the web before the knige is engaged to cut the web.

22. The system defined in claim 15 wherein a stripper spring member is coupled for compression when the jaws are moved into engagement, and switching means reversing the operation of said reciprocable member is coupled for operation when the stripper spring is compressed during movement of the jaws over its stroke before engagement of the jaws thereby to prevent movement of the jaws into engagement when a foreign object comes between the jaws.

23. A packaging system substantially as herein described with reference to and as illustrated in the accompanying drawings.

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